NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

WETLAND ENHANCEMENT

(Ac.)

CODE 659

DEFINITION

The rehabilitation or re-establishment of a degraded wetland, and/or the modification of an existing wetland, which augments specific site conditions for specific species or purposes; possibly at the expense of other functions and other species.

PURPOSE

To provide specific wetland conditions to favor specific wetland functions and targeted species by:

- hydrologic enhancement (depth duration and season of inundation, and/or duration and season of soil saturation).
- vegetative enhancement (including the removal of undesired species, and/or seeding or planting of desired species).

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on any degraded or non-degraded existing wetland sites with hydric soils, or problem soils that are hydric, where the objective is specifically to enhance selected wetland functions. This includes sites where some or all of the hydric soils, or problem hydric soils, have been degraded to the point that they no longer meet wetland criteria.

For embankment projects, this practice applies only to areas where the predominant slope is four percent or less.

This practice does not apply to the following where the intention is to:

- treat point and non-point sources of water pollution (Constructed Wetland 656);
- rehabilitate a degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned to original conditions (Wetland Restoration 657);
- create a wetland on a site that historically was not a wetland (Wetland Creation 658).

CRITERIA

General Criteria Applicable to All Purposes

The purpose, goals and objectives of the enhancement shall be clearly outlined, including the soils, hydrology and vegetation criteria that are to be met and are appropriate for the site and the project purposes.

The impact of this practice on existing wetland functions and/or values will be evaluated. All federal, State and local requirements shall be addressed.

The soils, hydrology and vegetative characteristics existing on the site and the contributing watershed shall be documented before enhancement of the site begins.

Where known nutrient and pesticide contamination exists, species selected will be tolerant of these conditions.

Sites containing hazardous material shall be cleaned prior to the establishment of this practice. Appropriate actions to clean sites suspected of containing hazardous wastes shall be based on soil tests.

Where offsite drainage or the presence of noxious or invasive plant species impact the site, the design shall compensate for these

landscape changes (e.g., increased water depth, berms or microtopography).

Invasive species, federal/state listed noxious plant species, and nuisance species (e.g., those whose presence or overpopulation jeopardize the practice) shall be controlled on the site. The establishment and/or use of non-native plant species shall be discouraged.

Any use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals shall assure that the intended purpose of the wetland enhancement shall not be compromised.

Criteria for Hydrologic Enhancement

General Requirements - The hydrology of the site (defined as the rate and timing of inflow and outflow, source, duration, frequency, and depth of flooding, ponding or saturation) shall meet the project objectives. An adequate source of water must be available to meet hydrology designs.

The work associated with the wetland shall not adversely affect adjacent properties or other water users unless agreed to by signed written letter, easement or permit.

Wetland hydrology may be provided by using a variety of measures, including but not limited to embankments, surface drain plugs, subsurface drain plugs, removal of fill material, and shallow excavation. These measures may not be needed on sites with degraded wetlands, where the natural hydrology has not been significantly modified.

On sites that have been in long-term agricultural use, grading and shaping can be used as needed to restore the diverse micro topography that occurs naturally in wetlands.

Water depths for at least ninety percent of the total area below designed normal water elevation will be six feet or less.

Embankments – Embankments may be used to impound water and provide wetland hydrology. Refer to the criteria for embankments in the Pennsylvania Conservation Practice Standard for Pond, Code 378. For embankment projects, water depths for at least sixty percent of the total area below the designed normal water elevation will be eighteen inches or less.

The overall bottom slope from the six foot water depth to zero will be convex or flat, but not concave.

Transitions in water depth from both six feet to eighteen inches and eighteen inches to zero will maximize shallower depths.

Timing and level setting of any water control structures installed is required for the establishment of desired hydrologic conditions for management of vegetation and for optimum wildlife and fish use.

Existing drainage systems will be utilized, removed or modified as needed to achieve the intended purpose.

Surface Drain Plugs - In areas where open ditches were constructed to provide drainage, wetland hydrology may be restored or enhanced by constructing surface drain plugs, using a pipe riser or other structures within the ditch to control the water level, or by filling a surface drain to the original ground line. Refer to the criteria for embankments when fill will be placed on the ditch banks.

All fill shall be similar to adjacent soil materials and be compacted to achieve the density of the adjacent materials. Crown the fill a minimum of one foot above the top of the lower existing channel bank to account for settling.

The minimum length of surface drain plugs shall be (6H + 4) feet. "Minimum length" refers to the length as measured along the top of the plug. "H" is measured from the settled top of the embankment to the low point along the centerline of the embankment (fill).

Subsurface Drain Plugs - In areas where subsurface drains were used to lower the water table, wetland hydrology may be restored or enhanced by removing or plugging the drain or replacing the perforated drain with a non-perforated drain.

The minimum length of drain to be removed or plugged shall be as follows:

Length of Drain	Average Hydraulic Conductivity of Soil
50 feet	<0.6 inches/hour
100 feet	0.6 to 2.0 inches/hour

150 feet	>2.0 inches/hour

All envelope filter material or other flow enhancing material shall also be removed for this length. The trench used to alter the drain shall be filled and compacted to achieve a density equal to adjacent natural soil material.

When subsurface drains also function as outlets for other drained areas where drainage is still desired, appropriate measures must be incorporated to keep the upstream drainage systems functional. A non-perforated pipe shall replace the perforated pipe through the wetland area to be enhanced, and shall extend beyond the wetland in all directions at least the minimum length previously specified for length of drain to be removed or plugged. Drains may also be re-routed around the wetland at the same minimum distances from the wetland, or where topography permits, setting a water control structure at a level that does not affect upstream drainage.

A water control structure may be placed on the inlet of an existing drain. The water control structure shall be attached to a non-perforated conduit that extends at least the minimum length previously specified for length of drain to be removed. The connections of the water control structure and the non-perforated pipe shall be watertight.

Removal of Fill Material – On sites where a wetland has been filled by sediment, land shaping, or other activities, the hydrology may be restored by removing the fill material from the site. Fill material shall be removed only to the top of the buried hydric soil, placed on an upland site, and stabilized so that no erosion of the material occurs.

Shallow Excavation - A wetland may be enhanced by excavating below the existing ground surface to create a shallow basin that will hold surface water and/or intercept groundwater. The basin shall permit storage of water at a depth, frequency, and duration to support the desired plant community and provide other wetland functions.

Criteria for Vegetative Enhancement

Establish native hydrophytic vegetation typical for the wetland type(s) being established.

Each state will develop specific guidelines that consider soil, seed sources and species.

Where natural colonization of selected species will dominate within 5 years, natural regeneration can be left to occur.

Adequate substrate material and site preparation necessary for proper establishment of the selected plant species shall be included in the design.

If the targeted hydrophytic vegetation is predominantly herbaceous, several species adapted to the site shall be established. Herbaceous vegetation may be established by a variety of methods including: mechanical or aerial seeding, topsoiling, organic mats, etc., over the entire site, or a portion of the site and at densities and depths appropriate.

For forested wetland establishment, where six or more native species are adapted to the site, reforestation shall include at least six species.

Seeding rates shall be based upon percentage of pure live seed within 6 months of planting.

CONSIDERATIONS

Consider manipulation of water levels to control unwanted vegetation.

Consider existing wetland functions and/or values that may be adversely impacted.

Consider effect enhancement will have on disease vectors such as mosquitoes.

The inclusion of microtopography can achieve changes in depth and duration of flooding without changing extent of surface area.

Consider effect of volumes and rates of runoff, infiltration, evaporation and transpiration on the water budget.

Consider effects on downstream flows or aquifers that would affect other water uses or users.

Consider effects on fish and wildlife habitats that would be associated with the practice.

Consider linking wetlands by corridors wherever appropriate to enhance the wetland's use and colonization by the flora and fauna.

Establishing vegetative buffers on surrounding uplands can reduce sediment and soluble and

sediment-attached contaminant delivery by runoff and/or wind.

Consider effects on temperature of water resources to prevent undesired effects on aquatic and wildlife communities.

Soil disturbance associated with the installation of this practice may increase the potential for invasion by unwanted species.

On sites where woody vegetation will dominate, consider adding 1 to 2 dead snags, tree trunks or logs per acre to provide structure and cover for wildlife and a carbon source for food chain support.

For discharge wetlands, consider underground upslope water and/or groundwater source availability.

When determining which species to plant, consider microtopography and the different hydrology levels.

Consider the effects that location, installation and management may have on subsurface cultural resources.

Consider the effect of water control structures on the ability of fish to move in and out of the wetland.

Consider the impact that water surface drawdown will have by concentrating aquatic species such as turtles into diminished pool areas, resulting in potential mortality. The timing and duration of draw-downs are also important to protect amphibians and reptiles from being exposed during extreme cold temperatures.

NOTE: State permits must be obtained to lower pools of impoundments for activities regulated by *other* state permits, or for any impoundment larger than one surface acre. Activities requiring draw down may include construction, maintenance or biological manipulation.

Consider timing of water control to mimic the natural hydrological regime of the area, further enhancing the habitat for aquatic species.

Consider design modifications that will limit potential negative impacts of wetland plants and animals on the project.

PLANS AND SPECIFICATIONS

Specifications for this practice shall be prepared for each site. Specifications shall be recorded using approved specifications sheets, job sheets, narrative statements in the conservation plan, or other documentation. Requirements for the operation and maintenance of the practice shall be incorporated into site specifications. Plans and specifications should be reviewed by staff with appropriate training in design and implementation of wetland enhancement.

OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance).

Biological control of undesirable plant species and pests (e.g., using predator or parasitic species) should be implemented where available and feasible.

Inspection schedule for embankments and structures for damage assessment.

Depth of sediment accumulation to be allowed before removal is required.

Management needed to maintain vegetation, including control of unwanted vegetation, including noxious and invasive species.

REFERENCES

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